CLAIMS

1. A prosthetic aortic valve, comprising

a substantially round tubular valve body, a longitudinal axis, an outlet end, a flared inlet end, an inner surface, and an outer surface, said outer surface comprising a semirigid sewing flange and a circumferential groove on said outer surface, said groove lying between and spacing apart said flared inlet end and said semirigid sewing flange; and

flow control means within said tubular valve body, said flow control means for intermittently and reversibly sealing across said valve body inner surface to allow substantially unidirectional flow through said tubular valve body from said inlet end to said outlet end;

wherein said semirigid sewing flange comprises at least first and second flange portions, and wherein said flange portions are spaced apart from each other and from said flared inlet end, a plurality of said flange portions comprising at least one post for securing sutures.

2. The aortic valve of claim 1 wherein said at least first and second flange portions are spaced between about 4 millimeters and about 12 millimeters from said flared inlet end.

3. The aortic valve of claim 1 wherein each post for securing sutures comprises a tissue adherence area.

4. The aortic valve of claim 3 wherein said groove comprises a circumferential tissue adherence band.

5. The aortic valve of claim 1 comprising first, second and third flange portions.

6. The aortic valve of claim 5 wherein said first and second flange portions subtend an angle at said valve body longitudinal axis of about 130 degrees.

7. The aortic valve of claim 6 wherein said second and third flange portions subtend an angle at said valve body longitudinal axis of about 115 degrees.

8. The aortic valve of claim 1 wherein said tubular valve body comprises pyrolytic carbon, wherein each post for securing sutures comprises a non-fibrous tissue adherence area comprising unpolished pyrolytic carbon, and wherein said circumferential groove on said valve body comprises a non-fibrous tissue adherence band, said band comprising unpolished pyrolytic carbon.

9. A prosthetic aortic valve, comprising

a substantially round tubular valve body, a longitudinal axis, an outlet end, a flared inlet end, an inner surface, and an outer surface, said outer surface comprising a semirigid sewing flange and a circumferential groove on said outer surface, said groove lying between and spacing apart said flared inlet end and said semirigid sewing flange; and

flow control means within said tubular valve body, said flow control means for intermittently and reversibly sealing across said valve body inner surface to allow substantially unidirectional flow through said tubular valve body from said inlet end to said outlet end;

wherein said semirigid sewing flange comprises at least first and second flange portions, and wherein said flange portions are spaced apart from each other and from said flared inlet end, a plurality of said flange portions comprising at least one cleat for securing sutures.

10. The aortic valve of claim 9 wherein said at least first and second flange portions are spaced between about 4 millimeters and about 12 millimeters from said flared inlet end.

11. The aortic valve of claim 9 wherein each cleat for securing sutures comprises a tissue adherence area.

12. The aortic valve of claim 11 wherein said groove comprises a circumferential tissue adherence band.

13. The aortic valve of claim 9 comprising first, second and third flange portions.

14. The aortic valve of claim 13 wherein said first and second flange portions subtend an angle at said valve body longitudinal axis of about 130 degrees.

15. The aortic valve of claim 14 wherein said second and third flange portions subtend an angle at said valve body longitudinal axis of about 115 degrees.

16. The aortic valve of claim 9 wherein said tubular valve body comprises pyrolytic carbon, wherein each cleat for securing sutures comprises a non-fibrous tissue adherence area comprising unpolished pyrolytic carbon, and wherein said circumferential groove on said valve body comprises a non-fibrous tissue adherence band, said band comprising unpolished pyrolytic carbon.

17. A method of replacing an aortic valve in a patient with the aortic valve of claim 1, the method comprising

preparing the patient for surgery to expose the patient's ascending aorta;

performing a supracoronary aortotomy for exposing the right and left coronary arteries, the right, left and non-coronary cusps and commissures, the ascending aortic intima, and the aortic valve annulus in a patient needing an aortic valve replacement;

surgically preparing said patient for aortic valve implantation at said annulus;

placing at least one circumferential tensioning cord;

inserting said inlet end of an aortic valve according to claim 1 into said annulus, said aortic valve being sized to closely fit said annulus between said flared inlet end and said semirigid sewing flange;

rotating said aortic valve according to claim 1 to position said first flange portion adjacent to said commissure between said right and left coronary arteries;

tensioning said at least one circumferential tensioning cord to prevent blood leakage between said valve body and said annulus; and

placing at least one valve retention suture from each said flange portion post to an adjacent commissure.

18. A method of replacing an aortic valve in a patient with the aortic valve of claim 9, the method comprising

preparing the patient for surgery to expose the patient's ascending aorta;

performing a supracoronary aortotomy for exposing the right and left coronary arteries, the right, left and non-coronary cusps and commissures, the ascending aortic intima, and the aortic valve annulus in a patient needing an aortic valve replacement;

surgically preparing said patient for aortic valve implantation at said annulus;

placing at least one circumferential tensioning cord;

inserting said flared inlet end of an aortic valve according to claim 9 into said annulus, said aortic valve being sized to closely fit said annulus between said flared inlet end and said semirigid sewing flange;

rotating said aortic valve according to claim 9 to position said first flange portion adjacent to said commissure between said right and left coronary arteries;

tensioning said at least one circumferential tensioning cord to prevent blood leakage between said valve body and said annulus; and

placing at least one valve retention suture from each said flange portion cleat to an adjacent commissure.

19. The method of claim 17 wherein said tubular valve body comprises first, second and third flange portions of a semirigid sewing flange.

20. The method of claim 18 wherein said tubular valve body comprises first, second and third flange portions of a semirigid sewing flange.

21. The method of claim 17 wherein at least one valve retention suture is placed from each said flange portion to each said commissure.

22. The method of claim 18 wherein at least one valve retention suture is placed from each said flange portion to each said commissure.

23. The method of claim 17 wherein said semirigid sewing flange is discontinuous adjacent to each said right and left coronary artery.

24. The method of claim 18 wherein said semirigid sewing flange is discontinuous adjacent to each said right and left coronary artery.

25. A prosthetic aortic valve, comprising

a substantially round tubular valve body having a flared inlet end spaced apart from a semirigid sewing flange by an external groove; and

flow control means within said tubular valve body, said flow control means for intermittently and reversibly sealing across said tubular valve body inner surface for allowing substantially unidirectional flow through said tubular valve body;

wherein said groove comprises a circumferential tissue adherence band, and wherein said discontinuous semirigid sewing flange comprises first, second, and third arcuate flange portions, and wherein said flange portions are contiguous and are spaced apart from said flared inlet end, and wherein each said flange portion comprises at least one hole for securing sutures to each said flange portion of said plurality of flange portions.

26. A prosthetic aortic valve, comprising

a substantially round tubular valve body having a flared inlet end spaced apart from a semirigid sewing flange by an external groove; and

flow control means within said tubular valve body, said flow control means for intermittently and reversibly sealing across said tubular valve body inner surface for allowing substantially unidirectional flow through said tubular valve body;

wherein said groove comprises a circumferential tissue adherence band, and wherein said discontinuous semirigid sewing flange comprises first, second, and third arcuate flange portions, and wherein said flange portions are non-coplanar and are spaced apart from said flared inlet end, and wherein each said flange portion comprises at least one hole for securing sutures to each said flange portion of said plurality of flange portions.

27. A patient having the aortic valve of claim 1 implanted in the aortic annulus and extending into the ascending aorta about as far as said patient's aortic valve commissures, wherein said valve is attached to said patient by at least one suture from each said post to each said commissure, and wherein at least one circumferential tensioning cord is tensioned around said tubular valve body to prevent blood leakage around said valve body.

28. A patient having the aortic valve of claim 9 implanted in the aortic annulus and extending into the ascending aorta about as far as said patient's aortic valve commissures, wherein said valve is attached to said patient by at least one suture from each said cleat to each said commissure, and wherein at least one circumferential tensioning cord is tensioned around said tubular valve body to prevent blood leakage around said valve body.

29. The patient of claim 27 wherein tissue adhesive is applied between said annulus and said tubular valve body.

30. The patient of claim 28 wherein tissue adhesive is applied between said annulus and said tubular valve body.

31. A prosthetic aortic valve, comprising

a tubular valve body having a flared inlet end;

internal flow control means allowing unidirectional blood flow through said valve body;

an external discontinuous semirigid sewing flange for securing said valve body in a patient; and

an external non-uniform circumferential groove on said valve body between said flared inlet end and said sewing flange.

32. The prosthetic valve of claim 31 wherein said semirigid sewing flange comprises a plurality of tissue adherence areas on tissue contact surfaces.

33. A prosthetic aortic valve, comprising

a tubular valve body having an inlet and an outlet;

internal flow control means allowing unidirectional blood flow through said valve body;

an external discontinuous semirigid sewing flange for securing said valve body in a patient; and

a sealing ring comprising an external circumferential tissue adherence band on said valve body between said inlet and said sewing flange.

34. The prosthetic valve of claim 33 wherein said semirigid sewing flange comprises a plurality of tissue adherence areas on tissue contact surfaces.